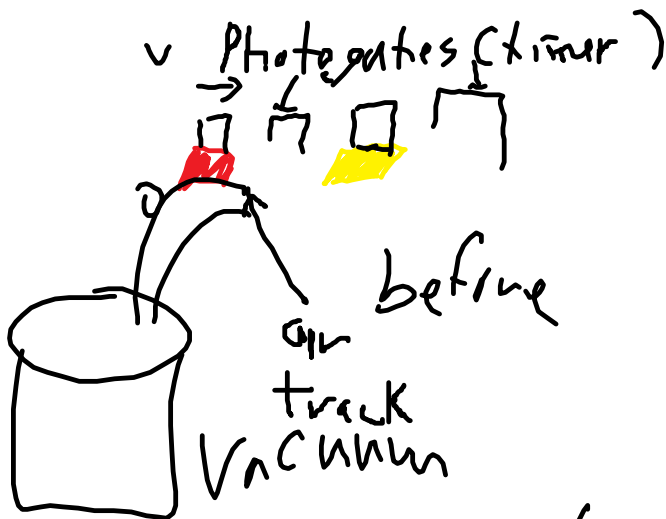


quiz

Review:

Red cart: mass: 41.59g Length of card: 5.9cm

Gold cart: mass: 84.34g Length of card: 8.3cm



time red before: 0.0808 s
time red after (bouncing back) 0.3003 s
time gold after: 0.1887 s

eg. p red cart before = $41.59\text{g} \times 5.9\text{cm} / 0.0808\text{s} = 41.59 \times 5.9 / 0.0808 = 3,036.8936 \text{ gcm/s}$

or 3.0 kg cm/s or
0.030 kgm/s

eg. p red cart after = $41.59\text{g} \times 5.9\text{cm} / 0.3003\text{s} = 41.59 \times 5.9 / 0.3003 = 817.1195 \text{ gcm/s}$

-0.00817 kgm/s

eg. p gold cart after = $84.34\text{g} \times 8.3\text{cm} / 0.1887\text{s} =$

$$84.34 \times 8.3 / 0.1887 = 3,709.7085 \text{ gcm/s}$$

$$0.037 \text{ kgm/s}$$

total momentum before = 0.030 kgm/s (gold is not moving)

$$\text{total momentum after} = -0.00817 + 0.037 = 0.02883$$

$$0.029 \text{ kgm/s}$$

difference is 0.001 kgm/s - caused by friction

Part 2.



time of gold before: 0.1305

time of red after: 0.1363s

time of gold after: 0.1987s

$$\text{eg. p gold cart before} = 84.34 \text{g} \times 8.3 \text{cm} / 0.1305 \text{s} =$$

$$84.34 \times 8.3 / 0.1305 = 5,364.1533 \text{ gcm/s}$$

$$0.0536 \text{ kgm/s}$$

$$\text{eg. p red cart after} = 41.59 \text{g} \times 5.9 \text{cm} / 0.1363 \text{s} =$$

$$41.59 \times 5.9 / 0.1363 = 1,800.3008 \text{ gcm/s}$$

$$0.0180 \text{ kgm/s}$$

$$\text{eg. p gold cart after} = 84.34 \text{g} \times 8.3 \text{cm} / 0.1987 \text{s} =$$

$$84.34 \times 8.3 / 0.1987 = 3,523.0096 \text{ gcm/s}$$

$$0.0352 \text{ kgm/s}$$

total momentum before = 0.0536 kgm/s (red is not moving)

$$\text{total momentum after} = 0.0180 + 0.0352 = 0.0532 \text{ kgm/s}$$

difference is 0.000 kgm/s - caused by friction

Block 2-4

quiz

Review:

Red cart: mass: 41.59g Length of card: 5.9cm

Gold cart: mass: 84.34g Length of card: 8.3cm



time red before: 0.0519
 time red after bounce back) 0.2679
 time gold after: 0.1294

eg. p red cart before = $41.59\text{g} \times 5.9\text{cm} / 0.0519\text{s} = 41.59 \times 5.9 / 0.0519 = 4,727.9576 \text{ gcm/s}$

0.0473 kgm/s

eg. p red cart after = $41.59\text{g} \times 5.9\text{cm} / 0.2679\text{s} = 41.59 \times 5.9 / 0.2679 = 915.9425 \text{ gcm/s}$

-0.00915 kgm/s

eg. p gold cart after = $84.34\text{g} \times 8.3\text{cm} / 0.1294\text{s} = 84.34 \times 8.3 / 0.1294 = 5,409.7527 \text{ gcm/s}$

0.0541 kgm/s

total momentum before = 0.0473 kgm/s (gold is not moving)

total momentum after = $-0.00915 + 0.0541 = 0.04495$

difference = $0.04495 - 0.0473 = -0.00235$

difference is 0.002 kgm/s - caused by friction

Part 2.



time of gold before: 0.1031

time of red after: 0.1259

time of gold after: 0.1839

eg. p gold cart before = $84.34\text{g} \times 8.3\text{cm} / 0.1031\text{s} = 84.34 \times 8.3 / 0.1031 = 6,789.7381 \text{ gcm/s}$

0.0679kgm/s

eg. p red cart after = $41.59\text{g} \times 5.9\text{cm} / 0.1259\text{s} = 41.59 \times 5.9 / 0.1259 = 1,949.0151 \text{ gcm/s}$

0.0195 kgm/s

eg. p gold cart after = $84.34\text{g} \times 8.3\text{cm} / 0.1839\text{s} = 84.34 \times 8.3 / 0.1839 = 3,806.5362 \text{ gcm/s}$

0.0381kgm/s

total momentum before = 0.0679kgm/s (red is not moving)

total momentum after = $0.0195 + 0.0381 = 0.0576 \text{ kgm/s}$

$p_f - p_i = 0.0576 - 0.0679 = -0.0103$

difference is 0.01kgm/s - caused by friction?

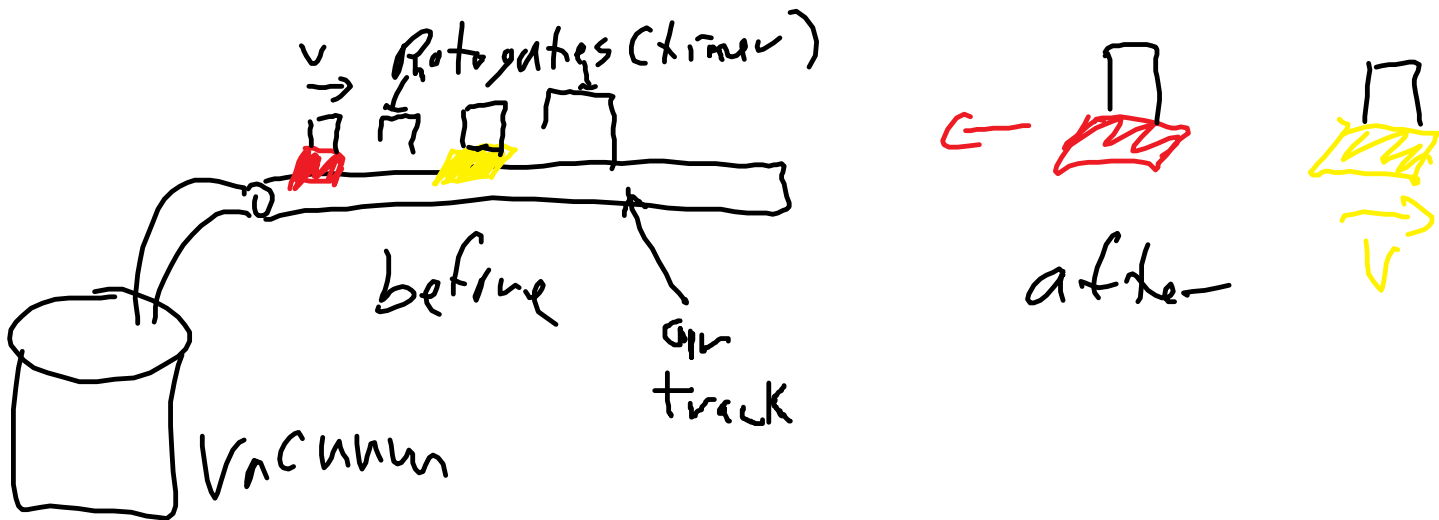
$0.01 / 0.0679 = 0.1473 = 15\% \text{ error}$

Block 2-2

Red cart: mass: 41.59g Length of card: 5.9cm

Gold cart: mass: 84.34g Length of card: 8.3cm

Part 1 - carts bounce off



time for red cart before: 0.1082s

gold cart was at rest before

time for red cart after: 0.4069s (p is -)

time for gold cart after: 0.2554s

$p = mv = md/t$ $d =$ length of the card

$p = 41.59\text{g} \times 5.9\text{cm} / 0.1082\text{s}$

$41.59 \times 5.9 / 0.1082 = 2,267.8466 \text{ gcm/s}$

$2.27 \text{ kgcm/s} = 0.0227\text{kgm/s}$

$p \text{ red cart after} = 41.59\text{g} \times 5.9\text{cm} / 0.4069\text{s} =$

$41.59 \times 5.9 / 0.4069 = 603.0499 \text{ gcm/s}$

-0.00603kgm/s

eg. $p \text{ gold cart after} = 84.34\text{g} \times 8.3\text{cm} / 0.2554\text{s} =$

$84.34 \times 8.3 / 0.2554 = 2,740.8849 \text{ gcm/s}$

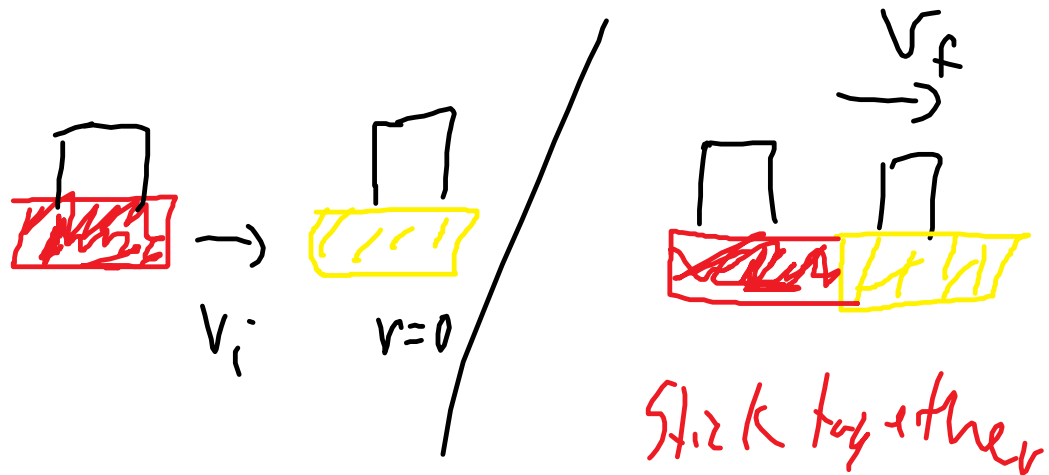
0.0274kgm/s

total momentum before = 0.0227kgm/s (gold is not moving)

total momentum after = $-0.00603 + 0.0274 = 0.02137$

difference = $0.0227 - 0.02137 = 0.00133$ lost
 difference is 0.001 kgm/s lost caused by friction

Part 2.



time for red before: 0.0489 s

gold at rest before

time for gold after: 0.2696 s

time for red after: 0.1910 s

Calculate P_{ti} and P_{tf} for
 both collisions

$p = mv = md/t$ $d = \text{length of the card}$

$p = 41.59 \text{ g} \times 5.9 \text{ cm} / 0.0489 \text{ s}$

$41.59 \times 5.9 / 0.0489 = 5,018.0164 \text{ gcm/s}$

$5.02 \text{ kgcm/s} = 0.0502 \text{ kgm/s}$

$p \text{ red cart after} = 41.59 \text{ g} \times 5.9 \text{ cm} / 0.1910 \text{ s} =$

$41.59 \times 5.9 / 0.1910 = 1,284.7173 \text{ gcm/s}$

0.0128 kgm/s

eg. $p \text{ gold cart after} = 84.34 \text{ g} \times 8.3 \text{ cm} / 0.2696 \text{ s} =$

$$84.34 \times 8.3 / 0.2696 = 2,596.5208 \quad \text{gcm/s}$$

$$0.0260 \text{kgm/s}$$

total momentum before = 0.0502kgm/s (gold is not moving)

$$\text{total momentum after} = 0.0128 + 0.0260 = 0.0388$$

$$\text{difference} = 0.0502 - 0.0388 = 0.0114 \text{ kgm/s lost}$$

difference is 0.011kgm/s lost caused by friction?